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Peer Review Report

Peer review report 2 On "A national inventory of seawater intrusion vulnerability for Australia"

Original Submission

Recommendation:

Minor Revision

Comments to Author:

This manuscript presents a useful application of analytical seawater intrusion assessment for Australia. The results are relevant for the local management context, but also provide additional examples and corroboration for the authors' previously developed analytical approach by including qualitative assessment results. The paper is well written with a good background, scope and justification for this work, although there is need for a little more discussion and clarification of results. I recommend that this paper is accepted for publication with minor revisions, as outlined below.

1) Line 150: It would be useful if there was a brief explanation of how SWI extent is measured in each aquifer type (i.e. the toe wedge position, mixed convection ratio and lens thickness). Also see Comment #6.
2) Section 2.2: It is not clear to the reader what form the results of the qualitative assessment are in (i.e. a numeric value or a vulnerability ranking of high, moderate and low). It would be useful to specify what the data is here so that the reader knows how this will be related to the analytical results.
3) Lines 205-207: The differences between field observations and the analytical results are informative in what way? I am curious to know how these results have differed from field observations. Some discussion of the results would be beneficial to support the credibility of the analytical approach.
4) Later on in Section 3.1.1, a discussion of the extents is needed. How does the range of theoretical extents for the confined and unconfined aquifers compare (80-670 km for confined and 6-15 km for unconfined). Do these seem realistic with any previous estimates of studies in the area or for similar hydrogeological settings?
5) Lines 207-209: Provide additional explanation as to what the M values represent. It is important for the reader to understand better what M physically represents, as it is the basis on which unconfined aquifer vulnerability is classified. Specifically, identify how M=1 is a significant value (threshold of stable/unstable conditions), and that the majority of values are <1, with 3 values representing unstable conditions and ranging from 1-11 - or something similar.
6) Lines 211-216: Include more discussion of active SWI at the 7 unstable sites and how this is related to offshore groundwater resources. The conclusions and abstract reference this, but explanation and discussion are missing from Section 3.
7) Section 3.1.1: More generally, a brief description of how each parameter (M, Xt, B) is a suitable descriptor of SWI extent would be beneficial. This ties in to Comment #1 and #10 as well.
8) Section 3.1.2: As in Comment #3, discuss the range in SWI Vulnerability indicators for Tables 4, 5, and 6. Is there a similar range for confined/unconfined or flux/head controlled? Do the orders of magnitude of vulnerability of one aquifer over another realistically represent orders of magnitude more vulnerability or propensity for SWI?

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2214-5818/$ – see front matter
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9) Section 3.1.4: Is it possible to classify vulnerability along some magnitudes or cutoff values, rather than in equal divisions of thirds? This way, it would not only be a relative ranking (relatively higher so in top third) and would result in a less even spread so more comparable to the qualitative approach? In Lines 296-297 it seems that the qualitative approach doesn't assign the H-M-L ranking based on a division in thirds. How were the qualitative classifications made? Could this approach be applied to the analytical results too?
10) Line 285: In general, it would be helpful if the distinction between the vulnerability indicators (looking at stresses) and the vulnerability classification (based on the SWI extents) was made clearer. It is a little confusing to the reader. This section could identify at the outset that the vulnerability classification was made based on current SWI extents so as to be comparable to the results of the qualitative assessment. Also, consider moving Lines 326-328 up to this section as well.
11) More broadly, the definition of vulnerability in this study is the propensity for SWI to occur. How do M, Xt and B describe that? It seems that the vulnerability indicators are a better representation of vulnerability as defined in the study than the vulnerability classification?
12) Lines 328-332: Explain what the particular benefits of the analytical approach are over the qualitative. From the results, it appears that if a qualitative assessment is available, it would be preferable as it includes more local data and would capture highs where the analytical may not detect them. It is stated in the conclusions that the analytical results are complemented by qualitative assessment. Can the authors explain why the qualitative approach alone wouldn't be preferable? Are the qualitative results meant to corroborate the analytical approach?

Suggested detailed edits:

- -Line 22-23: both SWI and seawater intrusion are used in the same sentence. Consider not using the SWI acronym in the abstract
- -Line 27: comma not necessary, or rework sentence.
- -Line 81: make a list by replacing 'and' with a comma "...underpinnings, require subjective..."
- -Line 93: the definition of SWI vulnerability could be introduced earlier as the term is already used several times before this point. Consider moving it up further in the text.
- -Line 207: specify "Unconfined aquifers are ranked..."
- -Line 218: specify "Confined aquifers are ranked..."
- -Line 218: add in what Xt stands for (wedge toe location) as you did for M and B.
- -Line 221: add to end of sentence about ranking unstable aquifers "...; however, these were assumed to represent the greatest SWI extent" or something similar.
- -Line 222: I understand that the authors mean that "discharge to the sea [is represented to occur] at the shoreline boundary. Make a distinction between what is expected to occur in physical reality and what is represented or simulated in the analytics.
- -Line 224: Specify what is ranked. SWI extent and vulnerability?
- -Line 265-272: The specifics of the recharge and SLR stresses are presented here, but the results of these changes are also included in Tables 4-6, presented earlier. I suggest that this information be moved up to the Methods section, where the stresses are first introduced. At the least, move them up to before Tables 4-6 are presented.

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